with EPA emissions standards for compression-ignition engines using an alternative phase-in schedule that correlates with the EPA OBD standards. If a manufacturer chooses to use the alternative phase-in schedule for meeting EPA standards and optionally chooses to comply early with the NHTSA fuel consumption program, it must use the same phase-in schedule beginning in model year 2013 for fuel consumption standards and must remain in the program for each model year thereafter. The fuel consumption standard for each model year of the alternative phase-in schedule is provided in Table 6 of this section. Note that engines certified to these standards are not eligible for early credits under § 535.7.

TABLE 6—ALTERNATIVE PHASE-IN COMPRESSION IGNITION ENGINE STANDARDS

Tractors	LHD Engines	MHD Engines	HHD Engines
Model Years 2013–2015	NA	5.03 gals/100 hp-hr	4.76 gals./100 hp-hr
Model Years 2016 and later†	NA	4.78 gals./100 hp-hr	4.52 gals/100 hp-hr
Vocational	LHD Engines	MHD Engines	HHD Engines
Model Years 2013–2015	6.07 gals/100 hp-hr	6.07 gals/100 hp-hr	5.67 gals/100 hp-hr
Model Years 2016 and later†	5.66 gals/100 hp-hr	5.66 gals/100 hp-hr	5.45 gals/100 hp-hr

†**Note:** these alternate standards for 2016 and later are the same as the otherwise applicable standards for 2017 and later.

§ 535.6 Measurement and calculation procedures.

(a) *Heavy-duty pickup trucks and vans.* This section describes the testing a manufacturer must perform for each model year and the method for determining the fleet fuel consumption performance to show compliance with the fleet average fuel consumption standard for heavy-duty pickup trucks and vans in § 535.5(a).

(1) For each model year, the heavy-duty pickup trucks and vans selected by a manufacturer to comply with fuel consumption standards in § 535.5(a) must be used to determine the manufacturer's fleet average fuel consumption performance. If the manufacturer's fleet includes conventional and advanced technology heavy-duty pickup trucks and vans, the fleet should be sub-divided into two separate vehicle fleets, with all of the conventional vehicles in one fleet and all of the advanced technology vehicles in the other fleet.

(2) Vehicles in each fleet should be divided into test groups or subconfigurations according to EPA in 40 CFR part 86, subpart S, and 40 CFR 1037.104.

(3) Test and measure the CO_2 emissions test results for the selected vehicles and determine the CO_2 emissions test group result, in grams per mile in accordance with 40 CFR part 86, subpart S.

(i) Perform exhaust testing on vehicles fueled by conventional and alternative fuels, including dedicated and dual fueled (multi-fueled and flexible fueled) vehicles and measure the CO_2 emissions test result.

(ii) Adjust the CO_2 emissions test result of dual fueled vehicles using a weighted average of your emission results as specified in 40 CFR 600.510–12(k) for light-duty trucks.

(iii) All electric vehicles are deemed to have zero emissions of CO_2, CH4, and N_2O. No emission testing is required for such electric vehicles. Assign the fuel consumption test group result to a value of zero gallons per 100 miles in paragraph (a)(4) of this section.

(iv) Test cab-complete and incomplete vehicles using the applicable complete sister vehicles as determined in 40 CFR 1037.104(g).

(v) Test loose engines using applicable complete vehicles as determined in 40 CFR 1037.104(h).

(vi) Manufacturers can choose to analytically derive CO_2 emission rates (ADCs) for test groups or subconfigurations. Calculate the ADCs for test groups or subconfigurations in accordance with 40 CFR 1037.104(g).

(4) Calculate equivalent fuel consumption test group results, in gallons per 100 miles, from CO_2 emissions test group results, in grams per miles, and round to the nearest 0.01 gallon per 100 miles.

(i) Calculate the equivalent fuel consumption test group results as follows for compression-ignition vehicles and

alternative fuel compression-ignition vehicles. CO_2 emissions test group result (grams per mile)/10,180 grams per gallon of diesel fuel) × (10^2) = Fuel consumption test group result (gallons per 100 mile).

(ii) Calculate the equivalent fuel consumption test group results as follows for spark-ignition vehicles and alternative fuel spark-ignition vehicles. CO_2 emissions test group result (grams per mile)/8,887 grams per gallon of gasoline fuel) × (10^2) = Fuel consumption test group result (gallons per 100 mile).

(5) Calculate the fleet average fuel consumption result, in gallons per 100 miles, from the equivalent fuel consumption test group results and round the fuel consumption result to the nearest 0.01 gallon per 100 miles. Calculate the fleet average fuel consumption result using the following equation.

$$\text{Fleet Average Fuel Consumption} = \frac{\sum[\text{Fuel Consumption Test Group Result}_i \times \text{Volume}_i]}{\sum[\text{Volume}_i]}$$

Where:

Fuel Consumption Test Group Result$_i$ = fuel consumption performance for each test group as defined in 49 CFR 523.4.

Volume$_i$ = production volume of each test group.

(6) Compare the fleet average fuel consumption standard to the fleet average fuel consumption performance. The fleet average fuel consumption performance must be less than or equal to the fleet fuel consumption standard to comply with standards in §535.5(a).

(b) *Heavy-duty vocational vehicles and tractors.* This section describes the testing a manufacturer must perform and the method for determining fuel consumption performance to show compliance with the fuel consumption standards for vocational vehicles and tractors in §535.5(b) and (c).

(1) Select vehicles and vehicle family configurations to test as specified in 40 CFR 1037.230 for vehicles that make up each of the manufacture's regulatory subcategories of vocational vehicles and tractors.

(2) Determine the CO_2 emissions and fuel consumption results for all vehicle chassis (conventional, alternative fueled and advanced technology vehicles) using the Greenhouse Emissions Model (GEM) in accordance with 40 CFR part 1037, subpart F. Vocational vehicles and tractor chassis are modeled using the following inputs in the GEM model. All seven of the following inputs apply for sleeper cab tractors, while some do not apply for vocational vehicles and other tractor regulatory subcategories:

(i) Identification of vehicles using regulatory subcategories (such as ''Class 8 Combination—Sleeper Cab—High Roof'').

(ii) Coefficient of aerodynamic drag in accordance with 40 CFR 1037.520 and 1037.521. Do not use for vocational vehicles.

(iii) Steer tire rolling resistance for low rolling resistance tires in accordance with 40 CFR 1037.520 and 1037.650.

(iv) Drive tire rolling resistance for low rolling resistance tires in accordance with 40 CFR 1037.520 and 1037.650.

(v) Vehicle speed limit as governed by vehicles speed limiters in accordance with 40 CFR 1037.520 and 1037.640. Do not use for vocational vehicles.

(vi) Vehicle weight reduction as provided in accordance with 40 CFR 1037.520. Do not use for vocational vehicles.

(vii) Extended idle reduction credit using automatic engine shutdown systems in accordance with 40 CFR 1037.520 and 1037.660. Do not use for vehicles other than Class 8 sleeper cabs.

(3) From the GEM results, select the CO_2 family emissions level (FEL) and equivalent fuel consumption values for vocational vehicle and tractor families in each regulatory subcategories for each model year. Equivalent fuel consumption FELs are derived in GEM and expressed to the nearest 0.1 gallons per 1000 ton-mile. For families containing multiple subfamilies, identify the FELs for each subfamily.

(4) Paragraphs (b)(1) through (3) of this section address vocational vehicle and tractor chassis testing only. Engine performance and the advanced technologies equipped on vocational vehicles and tractors are tested separately as follows:

(i) Vocational vehicle and tractor engine test results for conventional and alternative fueled vehicles are determined in accordance with § 535.6(c).

(ii) Improvements for advanced technologies are determined as follows:

(A) Test hybrid vehicles with power take-off in accordance with 40 CFR 1037.525 and vehicles with post-transmission hybrid systems in accordance with 40 CFR 1037.550.

(B) All electric vehicles are deemed to have zero CO_2 emissions and fuel consumption. No emission testing is required for such electric vehicles. Assign the vehicle family with a fuel consumption FEL result to a value of zero gallons per 1000-ton miles in paragraph (3) of this section.

(c) *Heavy-duty engines.* This section describes the testing a manufacturer must perform and the method for determining fuel consumption performance to show compliance with the fuel consumption standards for engines in § 535.5(d). Each engine must be tested to the primary intended service class that it is designed for in accordance with 40 CFR 1036.108

(1) Select emission-data engines and engine family configurations to test as specified in 40 CFR part 86 and part 1036, subpart C for engines installed in vehicles that make up each of the manufacture's regulatory subcategory.

(2) Test the CO_2 emissions for each emissions-data engine subject to the standards in § 535.5(d) using the procedures and equipment specified in 40 CFR part 1036, subpart F. Measure the CO_2 emissions in grams per bhp-hr as specified in 40 CFR part 86, subpart N, and part 1036, subpart C.

(i) Perform exhaust testing on each fuel type for conventional, dedicated, dual fuel (multi-fuel, and flexible fuel) vehicles and measure the CO_2 emissions level.

(ii) Adjust the CO_2 emissions result of dual fueled vehicles using a weighted average of the demonstrated emission results as specified in 40 CFR 1036.225. If EPA disapproves a manufacturer's dual fuel vehicle demonstrated use submission, NHTSA will require the manufacturer to only use the test results with 100 percent conventional fuel to determine the fuel consumption of the engine.

(iii) All electric vehicles are deemed to have zero emissions of CO_2 and zero fuel consumption. No emission or fuel consumption testing is required for such electric vehicles.

(3) Determine the CO_2 emissions for the family certification level (FCL) from the emissions test results in paragraph (c)(2) of this section for engine families within the heavy-duty engine regulatory subcategories for each model year.

(i) If a manufacturer certifies an engine family for use both as a vocational engine and as a tractor engine, the manufacturer must split the family into two separate subfamilies in accordance with 40 CFR 1036.230. The manufacturer may assign the numbers and configurations of engines within the respective subfamilies at any time prior to the submission of the end-of-year report required by 40 CFR 1036.730 and § 535.8. The manufacturer must track into which type of vehicle each engine is installed, although EPA may allow the manufacturer to use statistical methods to determine this for a fraction of its engines.

(ii) The following engines are excluded from the engine families used to determined FCL values and the benefit for these engines is determined as an advanced technology credits under the ABT provisions provided in § 535.7(e):

(A) Engines certified as hybrid engines or power packs.

(B) Engines certified as hybrid engines designed with PTO capability and that are sold with the engine coupled to a transmission.

(C) Engines with Rankine cycle waste heat recovery.

(4) Calculate equivalent fuel consumption values for emissions FCLs and the CO_2 levels for certified engines, in gallons per 100 bhp-hr and round each fuel consumption value to the nearest 0.01 gallon per 100 bhp-hr.

(i) Calculate equivalent fuel consumption FCL values for compression-ignition engines and alternative fuel

compression-ignition engines. CO_2 FCL value (grams per bhp-hr)/10,180 grams per gallon of diesel fuel) × (10 [2]) = Fuel consumption FCL value (gallons per 100 bhp-hr).

(ii) Calculate equivalent fuel consumption FCL values for spark-ignition engines and alternative fuel spark-ignition engines. CO_2 FCL value (grams per bhp-hr)/8,887 grams per gallon of gasoline fuel) × (10^2) = Fuel consumption FCL value (gallons per 100 bhp-hr).

(iii) Manufacturers may carryover fuel consumption data from a previous model year if allowed to carry over emissions data for EPA in accordance with 40 CFR 1036.235.

(iv) If a manufacturer uses an alternate test procedure under 40 CFR 1065.10 and subsequently the data is rejected by the EPA, NHTSA will also reject the data.

[76 FR 57493, Sept. 15, 2011; 76 FR 59922, Sept. 28, 2011]

§ 535.7 Averaging, banking, and trading (ABT) program.

(a) *Fuel consumption credits (FCC).* At the end of each model year, manufacturers may earn credits for heavy-duty vehicles and engines exceeding the fuel consumption standards in § 535.5 or by using one or more of the flexibilities in this paragraph (a) to gain credits. Manufacturers may average, bank, and trade fuel consumption credits for purposes of complying with fuel consumption standards. The following criteria and restrictions apply to averaging, banking and trading FCC (hereafter reference as the NHTSA ABT program).

(1) *Averaging.* Averaging is the exchange of FCC among a manufacturer's engines or vehicle families or test groups within an averaging set. With the exception of FCC earned for advance technologies as further clarified below, a manufacturer may average FCC only within the same averaging set. The principle averaging sets are defined in § 535.4.

(2) *Banking.* Banking is the retention of surplus FCC by the manufacturer generating the credits for use in future model years for averaging or trading. Banked FCC retain the designation from the averaging set and model year in which they were generated and expire after five model years.

(3) *Trading.* Trading is a transaction that transfers FCC between manufacturers or other entities. A manufacturer may use traded FCC for averaging, banking, or further trading transactions. Traded FCC, other than advanced technology credits, may be used only within the averaging set in which they were generated.

(b) *ABT provisions for heavy-duty pickup trucks and vans.* (1) This regulatory category consists of one regulatory subcategory, heavy-duty pickup trucks and vans. This one regulatory subcategory makes up one averaging set.

(2) Manufacturers that manufacture vehicles within this regulatory subcategory shall calculate credits at the end of each model year based upon the final average fleet fuel consumption standard and final average fleet fuel consumption performance value within this one regulatory subcategory as identified in paragraph (b)(8) of this section. If the manufacturer's fleet includes conventional vehicles (gasoline, diesel and alternative fuel) and advanced technology vehicles (hybrids with regenerative braking, vehicles equipped with Rankine-cycle engines, electric and fuel cell vehicles) it should be divided into two separate fleets each with its own final average fleet fuel consumption standard and final average fleet fuel consumption performance value. Credits shall be calculated for each of the two fleets.

(3) Fuel consumption levels below the standard create a ''credit surplus,'' while fuel consumption levels above the standard create a ''credit shortfall.''

(4) Surplus credits, other than advanced technology credits, generated and calculated within this averaging set may only be used to offset a credit shortfall in this same averaging set.

(5) Advanced technology credits can be used to offset a credit shortfall in this same averaging set or other averaging sets. However, a manufacturer must first apply advanced technology credits to any deficits in the same averaging set before applying them to other averaging sets.

(6) Surplus credits, other than advanced technology credits, may be traded among credit holders but must stay within the same averaging set.